

Claims

1. Method of controlling a wind turbine connected to an electric utility grid during malfunction in said electric utility grid, said method comprising the steps of

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detecting a malfunction in said electric utility grid,

monitoring at least one physical work property of at least one component of said wind turbine,

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comparing said at least one physical work property with at least one predefined limit, and

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controlling one or more wind turbine blades of said wind turbine in order to keep said at least one physical work property below at least one predefined limit in a time period of said malfunction.

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2. Method of controlling a wind turbine according to claim 1 where said detection for a grid malfunction is performed continuously or discontinuously e.g. every half second.

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3. Method of controlling a wind turbine according to claim 1 or 2 where said monitoring of at least one physical work property includes monitoring of the temperature in the stator and/or rotor of the generator, the semiconductors of the electric control systems, the transformer and/or the gear means of the wind turbine.

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4. Method of controlling a wind turbine according to any of claims 1 to 3 where the grid malfunction is detected as grid voltage, current, frequency and/or temperature variations above a first predefined limit.

5. Method of controlling a wind turbine according to any of claims 1 to 4 where said wind turbine is disconnected from the utility grid at temperatures or grid voltage, current, frequency variations above a second predefined limit.
- 5 6. Method of controlling a wind turbine according to any of claims 1 to 5 where the pitch of said one or more wind turbine blades is controlled to keep said at least one physical work property below at least one predefined limit in a time period of said malfunction.
- 10 7. Method of controlling a wind turbine according to any of claims 1 to 6 where the pitch is controlled continuously during the malfunction or in one or more steps such as an instantaneous step at the start of the malfunction.
- 15 8. Method of controlling a wind turbine according to claim 6 or 7 where the pitch of said one or more wind turbine blades is controlled in order to lower the generated power from the wind turbine generator during the malfunction e.g. from 100 to 30 % of the nominal power generation.
9. Method of controlling a wind turbine according to any of claims 1 to 8 where the optimal pitch is resumed after the malfunction has been detected as terminated.
- 20 10. Control system (16) for a wind turbine (1) connected and supplying electric energy to a utility grid (13), said system comprising
- 25 means (11) for detecting a malfunction in said electric utility grid, and means for monitoring at least one physical work property of at least one component of a wind turbine,
- 30 characterised in that

said system further comprises

means for comparison of said at least one physical work property and at least one predefined limit, and

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means (15) for controlling one or more wind turbine blades (5) of said wind turbine (1) in a time period of said malfunction

10 where said one or more wind turbine blades (5) are controlled in response to said comparison in order to keep said at least one physical work property below said at least one predefined limit.

11. Control system for a wind turbine according to claim 10, characterised in that said means for detecting a malfunction being means for detecting grid voltage, current, frequency and/or temperature variations.
12. Control system for a wind turbine according to claim 10 or 11, characterised in that said means for detecting a malfunction comprises predefined minimum and maximum limits for the voltage, current frequency values and/or temperature for comparison purpose.
13. Control system for a wind turbine according to any of claims 10 to 12, characterised in that said means for detection of a malfunction detects malfunction values continuously or discontinuously.
14. Control system for a wind turbine according to any of claims 10 to 13, characterised in that said system including storage means for at least one predefined limit value such as limit values for malfunction time, temperature, voltage, current and/or frequency variations.

15. Wind turbine (1) connected and supplying electric energy to a utility grid (13),
said turbine comprising

5 a number of components such as one or more generators (7, 7a, 7b), electric
control systems (17, 17a, 17b), transformers (12) and/or gear means (6) as well
as controllable rotor blades (5),

means (11) for detecting a malfunction in said electric utility grid, and

10 means for monitoring at least one physical work property of at least one of said
components,

c h a r a c t e r i s e d i n t h a t

15 said wind turbine further comprises

a control system (16) for comparison of said at least one physical work property
and at least one predefined limit, and

20 means (15) for controlling one or more wind turbine blades (5) in a time period
of said malfunction in order to keep said at least one physical work property
below said at least one predefined limit.

16. A family of wind turbines (22) such as one or more parks of wind turbines
25 connected and supplying electric energy to a utility grid (13), said family
comprising

at least two wind turbines (1) each with one or more controllable rotor blades
(5),

30 means (11) for detecting a malfunction in said electric utility grid,

means for monitoring at least one physical work property of at least one component of said at least two wind turbines,

5 a central control system (16) for comparison of said at least one physical work property and at least one predefined limit,

means (15) for controlling said one or more wind turbine blades of one or more of said at least two wind turbines in a time period of said malfunction in order to 10 keep said at least one physical work property below said at least one predefined limit.